

## TWO-YEAR OLD IMMUNIZATION COVERAGE SURVEY OF SOUTH CAROLINA CHILDREN 2001

The South Carolina Department of Health and Environmental Control's (DHEC) Immunization Division conducted an immunization coverage survey in order to estimate vaccination coverage levels among two-year old South Carolina children. The survey began in September, 2000, was completed in January 2001, and used a prospective, birth registry-based design.

### Sampling Frame

The sampling frame consisted of 12,822 live births occurring to South Carolina residents in South Carolina, Georgia, and North Carolina during the months of January, February, and March 1999. The sampling frame excluded known deaths and adoptions. The frame and sample were provided by DHEC's Division of Biostatistics, Office of Vital Records and Public Health Statistics.

In an effort to ensure that the sample would be representative of both Medicaid participants and non-participants, the frame was matched to the Medicaid eligibility file to determine the proportion of children who were ever eligible. The Medicaid matching was provided by The South Carolina Budget and Control Board, Office of Research and Statistics.

### Sample

Using the original Medicaid matched file which inaccurately classified approximately 17% of the Medicaid eligible children as non-Medicaid eligible, two samples of 308 children each were selected from the Medicaid eligible and non-Medicaid groups. The errors in classification of Medicaid status were detected after data collection had been initiated. The final file (with Medicaid eligibility correctly classified) yielded a sample of 362 Medicaid participants and 254 non-Medicaid participants.

### Data Collection

Names and birth dates of all children in the sample were compared against the DHEC PATS Immunization Registry. Four hundred and five (65.7%) children were found in the system. Of these 168 (27.3%) were 431331 (4 DTaP, 3 polio, 1 MMR, 3 Hib, 3 HepB, 1 varicella) series complete. The names and addresses of children who were not identified in the PATS Immunization Registry or who were not found to be 431331 series complete were forwarded to district staff for collection of immunization data.

Dates of each vaccine the child had received, the immunization provider or providers of those immunizations, birth date, sex, race, and county of residence were collected by district field staff on the data collection forms. Disposition codes were also collected as a means of studying the amount of effort required to collect these data. Procedures for data collection included searching health department immunization records, physician office immunization records, immunization records on military bases, community and rural health centers, and homeless shelters, and, where immunization data remained questionable, home visits were made in an attempt to locate non-responders. Data collection forms were batch processed for keying by an independent company and a data file was created for analysis. Coding was supervised by the Immunization Division.

## Data Analysis

Data analysis consisted of unweighted descriptive statistics about the sample and weighted vaccination coverage levels using multiple vaccine coverage criteria. These criteria included individual (antigen) specific analysis and combined series analysis. Additional data analysis rules applied in this survey were: (1) a minimum of a 28 day interval between doses of vaccine and, (2) MMR and Varicella must have been on or after the child's first birthday, and (3) no immunizations a child received on or after his/her second birthday were counted. The data were also analyzed by WIC and Medicaid participation. Statistical Analysis Systems (SAS) was used to perform all analyses of the survey data. Data analysis was conducted by DHEC's Immunization Division with assistance from the National Immunization Program's Health Services Research and Evaluation Branch.

## Results

Of the 616 children selected for the survey, 544 responses were collected, yielding a response rate of eighty-eight percent. Fifty-five of the 616 children (8.9%) were found to have moved out of state. Five of the 616 children (0.8%) could not be located during the survey period. Parents of nine children (1.5%) refused to participate. Two children had religious or medical exemptions. One child was deceased.

Among respondents 122 (22%) of the children received all immunizations in health department clinics only, 305 (56%) received all immunizations from sources other than the health department, and 117 (22%) received immunizations from a combination of public, private, or other providers. Two hundred and ninety-four children (54%) participated in WIC. Three hundred and twenty-six (60%) of the children in the final sample were of white race, while 212 (39%) were of black race. The remaining 1% of the final sample were children of Hawaiian, Indian, or Other Asian race.

Table 1 reports vaccination coverage rates as estimated by the 2000 and 2001 surveys. Methodologies vary in that the 2000 survey utilized a single simple random sample. Results of the 2001 survey are weighted and are representative of state rates.

**Table 1. Vaccination coverage levels among 2-year-olds\* with vaccines routinely recommended for children, by vaccination and period - South Carolina, 2001 and 2000.**

<u>Vaccination</u>	2001		2000	
	%	(95%CI§)	%	(95%CI§)
<u>Individual</u>				
<b><u>DTP/DT/DTaP¶</u></b>				
≥3 doses	98.2%	(97.1%-99.2%)	98.1%	(97.0%-99.3%)
≥4 doses	88.5%	(85.9%-91.1%)	88.4%	(85.7%-91.1%)
<b><u>Polio</u></b>				
≥3 doses	95.0%	(93.3%-96.8%)	95.3%	(93.5%-97.1%)
<b><u>Hib**</u></b>				
≥3 doses	97.7%	(96.5%-98.9%)	97.2%	(95.8%-98.6%)
<b><u>MMR</u></b>	96.9%	(95.5%-98.2%)	96.1%	(94.4%-97.7%)
<b><u>Hepatitis B</u></b>				
≥3 doses	94.8%	(93.0%-96.7%)	95.0%	(93.1%-96.8%)
<b><u>Varicella</u></b>	87.4%	(84.7%-90.2%)	81.5%	(78.2%-84.8%)
<u>Combined Series</u>				
4DTP/3Polio/ 1MMR	87.5%	(84.8%-90.3%)	88.0%	(85.3%-90.8%)
3DTP/3Polio/ 1MMR /3Hib	93.3%	(91.2%-95.4%)	92.9%	(90.7%-95.1%)
4DTP/3Polio/ 1MMR /3Hib	87.3%	(84.5%-90.1%)	87.7%	(84.9%-90.5%)
4DTP/3Polio/ 1MMR /3Hib /3HB†	84.5%	(81.4%-87.5%)	84.5%	(81.4%-87.6%)
4DTP/3Polio/ 1MMR /3Hib /3HB/1Var‡	77.5%	(74.0%-81.0%)	72.2%	(68.4%-76.0%)

\* Persons aged 730 days.

§ Confidence Interval.

¶ Diphtheria and tetanus toxoids and pertussis vaccine or diphtheria and tetanus toxoids vaccine.

\*\* *Haemophilus influenza* type b conjugate vaccine.

† Hepatitis B vaccine

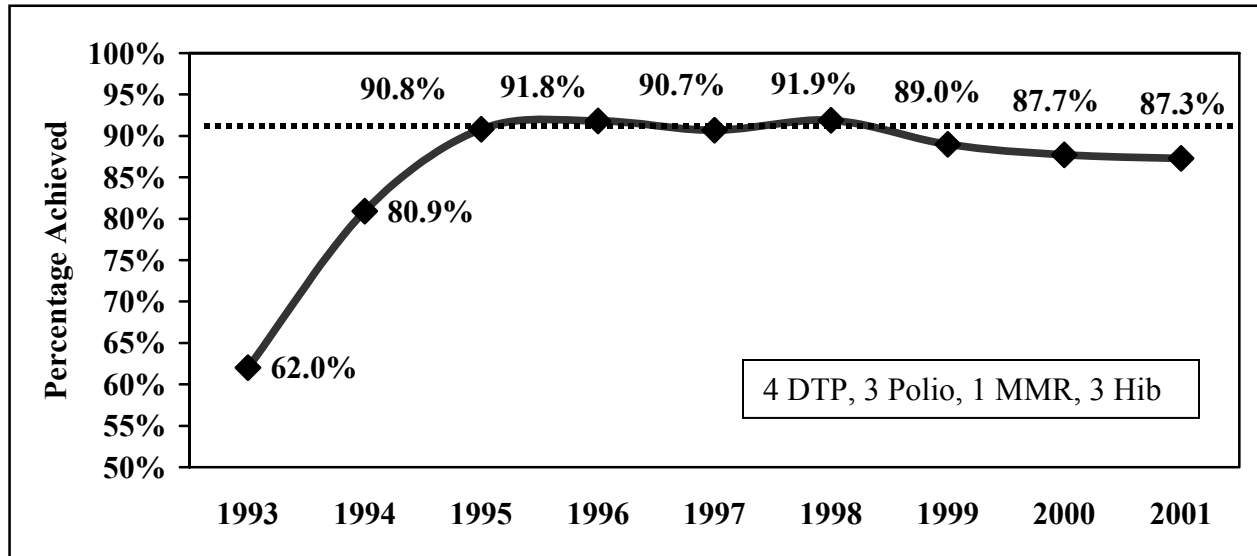
‡ Varicella vaccine

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## Discussion

A graph of immunization coverage rates in South Carolina since 1993 is shown in Table 2. The change in vaccination coverage from 87.7 percent in 1999 to 87.3 percent in 2001 is not statistically significant<sup>1</sup> and therefore, reaffirms that South Carolina's immunization activities continue to result in high levels of protection for the state's preschool aged population.

TABLE 2: South Carolina Immunization Coverage Rates 1993-2001



Immunization services for preschool children continue to be offered in both public health departments and private physicians' practices throughout the state (Table 3). The vaccination coverage level for children served by DHEC clinics increased slightly from 88.5 percent in 2000 to 88.9 percent in 2001, and for children served by Non-DHEC only practices, the vaccination coverage level decreased from 91.4 percent in 2000 to 88.4 percent (Table 4). Rates compared by provider type and district are also provided (Table 5).

<sup>1</sup> In past surveys, two methods were employed in determining if the coverage rate is significantly different from coverage rates found in previous years. A comparison of multiple proportions (Fliess, 1981) was not conducted this year because the current year's data is weighted. A comparison of 95% confidence intervals showed overlapping intervals for the years 1995-2001. A third test was also employed to determine if the 87.1% coverage rate was significantly different from 90% (Daniel, 1983). The test failed to show any significant difference.

TABLE 3: Percentage of Children Immunized by Health Department only, Health Department and Other Providers, and other than Health Department 1997-2001

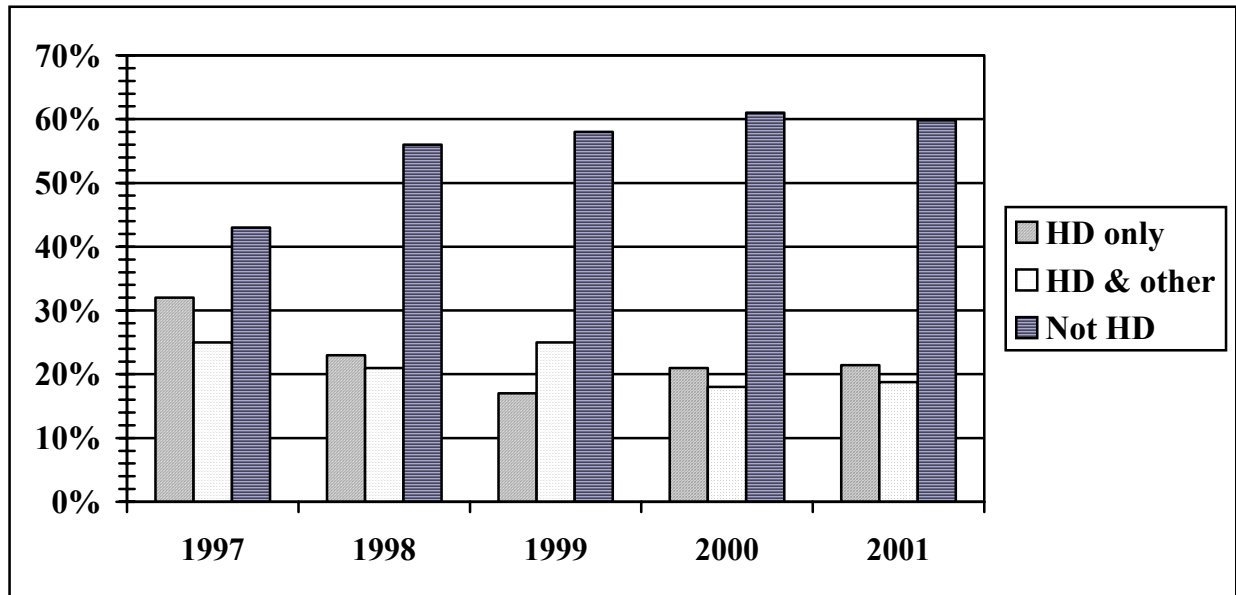


TABLE 4: South Carolina Immunization Coverage Rates by Provider Type 1998-2001

	1998	1999	2000	2001
Health Department Only	91.5%	94.6%	88.5%	88.9%
Health Department and Other Providers	92.5%	88.1%	74.0%	81.9%
Not Health Department	91.8%	87.7%	91.4%	88.4%

TABLE 5: South Carolina Immunization Coverage Rates by District and Provider Type  
NOTE: Percentages are based on very small numbers, interpret with caution.

District	Health Department Only	Health Department and Other Providers	Not Health Department
Appalachia I	100% n=15	83% n=5	80% n=12
Appalachia II	100% n=6	88% n=12	91% n=41
Appalachia III	61% n=8	100% n=12	85% n=21
Catawba	88% n=13	100% n=8	87% n=17
Edisto	100% n=7	67% n=6	100% n=4
Low Country	67% n=6	54% n=3	100% n=13
Lower Savannah	100% n=4	80% n=5	74% n=12
Palmetto	85% n=8	100% n=2	96% n=68
Pee Dee	100% n=5	62% n=22	93% n=29
Trident	84% n=22	100% n=11	92% n=30
Upper Savannah	100% n=3	70% n=16	78% n=22
Waccamaw	78% n=7	83% n=10	80% n=20
Wateree	100% n=18	83% n=5	63% n=16

Among Medicaid eligible children in South Carolina 84.8% are 4313 (4 DTP, 3 Polio, 1 MMR, 3 Hib) series complete, while 90% of the children who are not Medicaid eligible are 4313 series complete. Among WIC participants 84.9% are series complete, while 89.5% of the children who do not participate in WIC are series complete. (Table 6)

TABLE 6: South Carolina Immunization Coverage Rates by Medicaid and WIC participation.

	percent 4313 series complete	95% CI
Medicaid		
participants	84.8%	81.1% - 88.6%
non participants	90.0%	85.8% - 93.9%
WIC		
Participants	84.8%	80.7% - 89.0%
non participants	89.5%	85.8% - 93.2%

Analysis of coverage rates by race ('white' and 'black and other') showed a statistically significant difference in coverage rates for 2000. Table 7 describes coverage rates by race since 1994.

TABLE 7: South Carolina Immunization Coverage Rates by Race 1993-2001

year	White	Black and Other	Total	p-value ( $\chi^2$ )
2001	90.7%	81.5%	87.3%	<.0001
2000	90.2%	83.7%	87.7%	0.027
1999	88.3%	89.4%	89.0%	0.670
1998	92.2%	91.4%	91.9%	0.758
1997	90.9%	90.4%	90.7%	0.837
1996	93.4%	89.6%	91.8%	0.109
1995	90.7%	91.1%	90.8%	0.874
1994	84.4%	76.4%	80.9%	0.022

The coverage level among African-American, Asian, Hispanic, and Native American children is significantly lower than the coverage level for Caucasian children. This difference is not observed among children receiving immunization services from public clinics only. (Table 8).

TABLE 8: South Carolina Immunization Coverage Rates by Race and Provider Type 2001

Race	Health Department Only	Health Department and Others	Not Health Department	p-value ( $\chi^2$ )
White	89.7%	92.3%	90.7%	0.051
Black and other	88.1%	69.6%	83.5%	<.0001
p-value ( $\chi^2$ )	0.188	<.0001	<.0001	

Single antigen data for the 15 to 18 month (fourth) dose of DTaP continue to demonstrate the difficulty providers have with vaccinating children before 24 months of age. One percent of children are not series complete because they never received the fourth dose of DTaP vaccine. Four and a half percent were not series complete because they received the fourth dose of DTaP after they had reached their second birthday. Vaccine shortages and deferrals of the 4<sup>th</sup> dose of DTaP during the survey period may also have influenced coverage rates. Table 9 reports coverage rates if all children who were 3313 complete received the 4<sup>th</sup> dose of DTaP by 24 months of age. Although it is difficult to estimate the effect of vaccine deferrals on coverage rates, we can assume that coverage rates would fall between those reported above and those reported in Table 9 had there been no shortages or deferrals.



Table 9: Estimated 4313 Coverage Rates  
**Assuming all Children Received 4<sup>th</sup> Dose of DTaP by 24 months of age.**

	parameter	point estimate	95% CI
	all children	93.3%	91.2%-95.4%
provider type			
	Health Department Only	93.7%	89.1%-98.3%
	Health Department and Other Providers	94.9%	91.3%-98.5%
	Not Health Department	92.6%	89.8%-95.5%
Medicaid status			
	non-participant	94.2%	91.1%-97.4%
	participant	92.4%	89.6%-95.1%
WIC			
	non-participant	95.1%	92.5%-97.6%
	participant	91.3%	88.0%-94.6%
race			
	white	93.9%	91.3%-96.5%
	black and other	92.2%	88.8%-95.6%

Table 10: Analysis by race and Provider Type - Estimated 4313 Coverage Rates  
**Assuming all Children Received 4<sup>th</sup> Dose of DTaP by 24 months of age.**

Race	Health Department Only	Health Department and Others	Not Health Department	p-value ( $\chi^2$ )
White	94.0%	98.7%	92.7%	<.0001
Black and other	93.3%	90.5%	92.4%	0.033
p-value ( $\chi^2$ )	0.487	<.0001	0.593	

Varicella immunization was recommended in 1996. The number of two-year old children who have received the recommended one dose of varicella vaccine has increased from 58.3 percent in 1999 to 87.4 percent in 2001. Single antigen vaccination coverage levels among the state's preschool child population for all other vaccines except for the fourth dose of DTP remain above 90 percent.